

WHAT IS CLAIMED IS:

1. A light modulator, comprising:

an array comprised of rows and columns of interferometric display elements, each

element being divided into sub-rows of sub-elements;

array connection lines to transmit operating signals to the display elements, wherein
one connection line corresponds to one row of display elements in the array;

sub-array connection lines electrically connected to each array connection line; and

switches to transmit the operating signals from each array connection line to the sub-
rows to effect gray scale modulation.

2. The light modulator of claim 1, multiple sub-elements further comprising a sub-element
in each row for red, green and blue.

3. The light modulator of claim 1, column connection lines further comprising three column
connection lines, one each for red, green and blue sub-elements in each element.

4. The light modulator of claim 1, the switches further comprising microelectromechanical
switches.

5. The light modulator of claim 1, the switches further comprising switches of a similar
configuration as the interferometric display elements.

6. The light modulator of claim 1, the switches further comprising the sub-elements such
that when a selected sub-element is deflected, the selected sub-element causes the
operating signal from the array connection line to transfer from the selected sub-element
to an adjacent sub-element.

7. The light modulator of claim 1, the switches further comprising semiconductor transistor
switches.

8. A method of manufacturing an interferometric light modulator, the method comprising:

providing an array of interferometric display elements arranged in rows and columns,
each display element comprising:

a predetermined number of sub-rows of sub-elements, wherein the predetermined
number of sub-rows depends upon a desired bit-depth for a display; and

5 a predetermined number of sub-columns within each sub-row, wherein the
predetermined number of sub-columns corresponds to a desired number of colors
for the display;

arranging array connection lines for each row, such that each connection line
corresponds to one row of the array; and

10 providing electrical connection between the array connection line for each row to one
of the sub-rows of the corresponding row of the array.

9. The method of claim 8, arranging array connection lines for each row further comprising
arranging array connection lines between the array and a driver device.

10. The method of claim 8, providing electrical connection between the array connection line
15 further comprising providing connection to a set of microelectromechanical switches.

11. The method of claim 8, providing electrical connection between the array connection line
further comprising providing connection to a set of semiconductor switches.

12. The method of claim 10, the microelectromechanical switches further comprising
switches of a similar configuration as the interferometric display elements.

20 13. The method of claim 8, providing electrical connection further comprising deflecting a
sub-element of a sub-row, thereby forming a connection between the sub-element and an
adjacent sub-element.

14. A light modulator, comprising:

an array of interferometric display elements arranged in rows and columns, each
25 element comprising a predetermined number of sub-elements, wherein the number of

sub-elements is determined by a desired bit depth and each element is approximately the same size;

electrical connections between the sub-elements such that the electrical connection is forms a sub-element cascade; and

5 an array connection line corresponding to each row of display elements, wherein each array connection line is electrically connected to a sub-element in each display element.

15. The light modulator of claim 14, the modulator further comprising a predetermined number of sub-element cascades within each display element, wherein the predetermined
10 number is a desired number of colors.

16. The light modulator of claim 14, the modulator further comprising addressing circuitry to provide an addressing pulse to each sub-element cascade, wherein a number of sub-elements in the cascade that become active depends upon a length of the addressing pulse.

17. A method of manufacturing a light modulator, the method comprising:

15 providing an array of interferometric display elements arranged in rows and columns, each element comprising at least one sub-element cascade of a predetermined number of sub-elements; and
electrically connecting a first element in each sub-element cascade in a row to a corresponding connection line for that row;

20 18. The method of claim 17, the method further comprising providing an array of interferometric elements having at least one sub-element cascade further comprises providing a sub-element cascade for each desired color.

19. The method of claim 17, the method further comprising electrically connecting the connection lines for each row to a driver device.

25 20. A light modulator, comprising:

an array of interferometric elements, each element comprising a pre-determined number of sub-elements, each of a different size corresponding to a different binary weight of display information, wherein the number of sub-elements depends upon a desired bit depth.

- 5 21. The light modulator of claim 20, the pre-determined number of sub-elements further comprising four sub-elements, a first sub-element of half-size, a second sub-element of quarter-size and third sub element of eighth-size and a fourth sub-element of sixteenth size.
22. The light modulator of claim 20, the light modulator further comprising a connection line
10 for each of the sub-elements.
23. The light modulator of claim 20, the light modulator further comprising one connection line for each display element, and a set of switches electrically connected between the display element and the sub-elements, such that sub-elements needed to create a weighting of a pixel are activated in accordance with display information.
- 15 24. A method of manufacturing a light modulator, the method comprising:
providing an array of interferometric display elements;
forming sub-elements within each display element of a size approximately equal to one half a display element;
forming sub-elements as desired, each sub-element having a size approximately equal
20 to half the size of a next largest element.
25. The method of claim 24, the method further comprising forming a connection line for each sub-element.
26. The method of claim 24, the method further comprising forming a connection line for each display element and providing multiplexing switches in electrical connection
25 between the connection line and the sub-elements.
27. A method of operating a light modulator, comprising:

receiving a row selection signal for a row of display elements;

transmitting the row selection signal for a predetermined period of time to an array of sub-elements such that a predetermined number of sub-elements are activated.

28. A light modulator, comprising:

5 an array of elements having differing values of deflection versus time and deflection versus voltage; and

addressing lines to provide addressing pulses of varying voltage level and time to the array of elements such that different combinations of elements switch in a selectable manner, depending upon the voltage level and time duration of the addressing pulses.

10 29. The light modulator of claim 28, addressing lines arranged to provide one addressing for a row in the array of elements.

30. The light modulator of claim 28, the array of elements having differing mechanical structures to effect differing values of deflection versus time and deflection versus voltage.

15 31. The light modulator of claim 28, the array of elements having differing film thicknesses to effect differing values of deflection versus time and deflection versus voltage.